

# **Web Content Development and Management Using the Gong System**

Gibson Lam, David Rossiter and Roger Cheung

Department of Computer Science and Engineering,  
Hong Kong University of Science and Technology,

Clear Water Bay, Hong Kong

{gibson, rossiter, csroger}@cse.ust.hk

## **Abstract**

The Gong system is a Web-based voice communication system (<http://gong.ust.hk>). It allows people to communicate in discussion groups using text and audio over the Internet. Major features of the system include voice indexing, selective word/phrase playback, voice speed-up/slow-down, real-time recordable voice chat and the support for multiple languages such as English, Chinese and Japanese.

This paper discusses two different aspects of content development and management using the Gong system: developing audio enriched web content with a web page scripting interface, and integrating the Gong system with an arbitrary learning management system (LMS).

The Gong system provides an applet scripting interface so that a web page can be enhanced with audio by facilitating real-time communication between the HTML page and the applet. This communication is achieved by using web page scripting language such as JavaScript and VBScript. The applet can be hidden from the web page without anyone knowing it is present. Course content can then be hugely enriched using any of the advanced features such as voice indexing provided by the Gong system.

The second aspect discussed in this paper is the integration of the Gong system with course management systems. Usually, course content creators are not technically fluent. The accessibility of any component must be relatively simple within a course management system. To resolve issues involved in this kind of integration, we propose a generic method to integrate the Gong system into any LMS system. This method is demonstrated by integrating the Gong system into the Moodle LMS.

**Keywords:** e-Learning Tool, voice user interface, learning management system

# 1 Introduction

The Gong system is a Web-based voice communication tool. At a basic level of usage the system supports groups of people such as students and teachers participating in discussion groups using their computers. It supports both synchronous (real-time) and asynchronous voice and text communication. The website of the Gong project [1] provides additional information about the system. Anybody can download the software from the website and use it free for non-profit use.

This paper considers two aspects of the system that help web content development and management, particularly for learning systems.

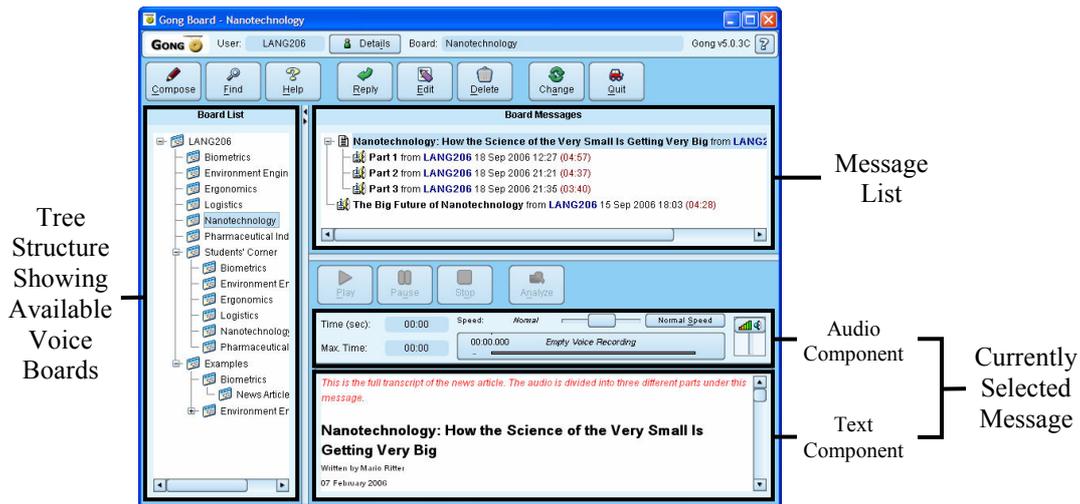
Firstly, an applet scripting interface has been developed. This interface allows real-time communication between web page components and the Gong applet. This real-time communication is accomplished by web page scripting language such as JavaScript and VBScript. Through the Gong web scripting interface the Gong system can be used to enhance the audio capability of web pages, without using any external program.

Secondly, there are emerging e-learning standards such as LOM [2] and SCORM [3] which allow sharing and integrating learning objects into learning management system (LMS) that supports the standards. However not all LMS support these standards or they only support the standards to varying extents. Because of this, a generic method has been developed so that the Gong system can be easily integrated into any LMS. This paper discusses the integration of the Gong system with one of the most popular open-source LMS, the Moodle LMS [4][5].

## 1.1 The Gong System

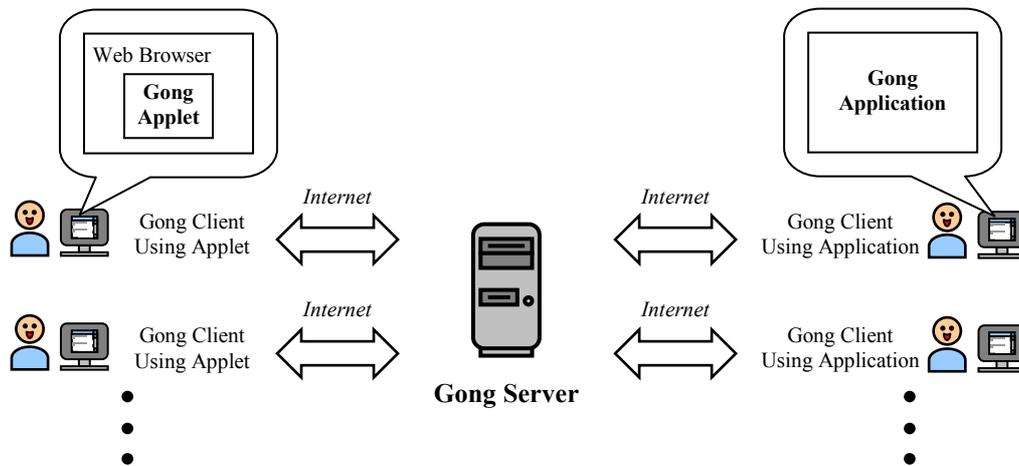
A basic use of the Gong system is for people to participate and communicate in voice boards. A voice board is a collection of voice and/or text messages. Users can post a new message, and read or reply to any message on a board. Figure 1 shows a typical voice board display in the Gong system. The message list shows the messages in the current voice board. The content of the currently selected message is shown at the lower half of the display, which includes the audio information and text content.

The entire system supports the input, storage and display of Unicode characters. That means any of hundreds of different languages can be used, with more than one language used at the same time. There is also special support for the input and display of the Cantonese and Putonghua dialects of Chinese [6]. In addition, there are two features which are particularly helpful to language learners. The first is the automatic index of an audio recording. After this has taken place users can select one or several words and hear just those words spoken. The second is the ability to adjust the playback speed of any voice message. For example, a student can play a message a lot slower if he/she finds it difficult to comprehend the original speech. The methodology and pedagogical usage of these features are discussed in [7].



**Figure 1. A typical display of a Gong voice board.**

The Gong system is built based on a client and server architecture using Java. When the system is used as a standalone system it can be used through an applet, an application or both. The Gong applet can be put on any web page. It requires the pre-installation of the Java runtime environment, which is present in most computers and can be easily added if it is not. The Gong application does not have such a requirement but it cannot be used as an integrated element of a web page, a LMS or another program. The following figure illustrates how the Gong system is used as a standalone system.



**Figure 2. Using the Gong system as a standalone system. It can be accessed by clients using an applet and/or an application.**

## 1.2 The Moodle Learning Management System

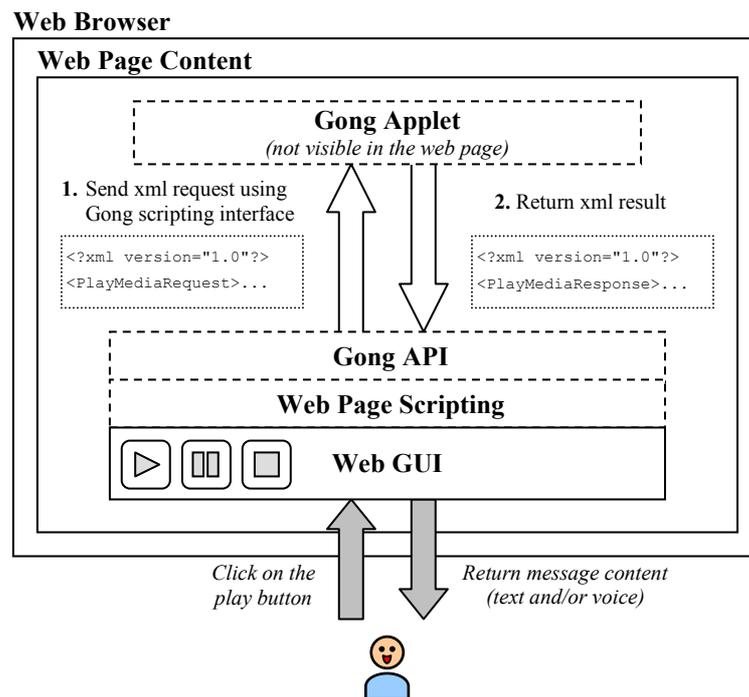
Moodle is a free open-source learning management system [4][5]. It is built using PHP and it can be downloaded, used and modified under the GNU General Public License. The license allows people to install it and extend it based on their needs. There is a whole community of developers who constantly contribute extensions to the system. These Moodle extensions are called modules. We now discuss our method for integrating the Gong system within an arbitrary LMS, and describe an implementation of the technique using Moodle.

## 2 Audio Enriched Web Content Development

The Gong system provides web content developers the opportunity to add audio capability to a website. For example, a course web page can contain a Gong voice board which allows students to discuss with the teachers verbally on the Web. However one shortcoming of using a voice board is the lack of flexibility in web content design. For example, depending on different situations teachers may want to have the ability to just play or stop an audio recording in a web page, without using or seeing any voice board. With this in mind we have designed a real-time communication method for web pages to communicate with the Gong applet. The applet can be hidden from the web page without the user knowing it is present. Using this method a web page can be greatly enriched by the features offered by the Gong system.

### 2.1 Methodology

The Gong applet allows any web component to control it through the Gong scripting interface. The interface is a simple API accessible by any web page scripting language, such as JavaScript and VBScript. That means script can be written inside a web page to make requests to the Gong applet through the API. These requests work when the applet is loaded, even if it is hidden.



**Figure 3. Communication between the Gong applet and web page components.**

Figure 3 illustrates the flow of communication between the Gong applet and other components. A web component sends a request, in XML format, to the applet through the Gong API. Once the applet receives the request the applet will process it and, if appropriate, return any result. For instance, a web designer can create a play button on a web page. When the play button is pressed an event will be generated. The designer can write a short script to send a play request to Gong when the event happens.

If a user presses the play button the script will be invoked. It simply forwards a play request to the applet through the Gong scripting interface. In this particular case there is no feedback from the applet for the play request.

There is only one API call in the interface. It takes one parameter in XML format, which specifies the name and parameters of the request. The API prototype is shown below:

*String sendGongRequest(String xmlString)*

For the current version of Gong, version 5, there are twenty one types of request available in the API. These requests correspond to nearly every action which a Gong applet can perform. Table 1 contains the list of request names and their descriptions.

<b>Category</b>	<b>Request Name</b>	<b>Description</b>
Media operation	Play Media	Start the playback of the selected message in the Gong applet
	Record Media	Start a new recording in the Gong applet
	Pause Media	Temporarily stop an active playback of the media
	Stop Media	Stop an active playback or recording
Media information	Set Media Time	Set the time of the media to any moment in time
	Get Media Time	Get the time of the media to any moment in time
	Set Media Rate	Set the playback rate of the media
	Get Media Rate	Get the playback rate of the media
	Get Media Status	Get the current status of the media in the applet
Board navigation and operation	Move to Previous Message	Move the selected message to the previous message in the list of messages
	Move to Next Message	Move the selected message to the next message in the list of messages
	Select Message	Select a particular message from the list of messages
	Get Current Message Id	Get the id of the currently selected message in the applet
	Search Message	Search for a message using search text and a range of options
	Post Message	Post a new message to the applet with a subject (mandatory), text and audio content (optional)
Message Information	Get Message	Get the XML representation of the text component of the currently selected message
	Get Message Content	Get the text content of the currently selected message in HTML or plain text format
	Get Current Token	Get the currently playing token (word) in the active playback
Board Information	Get Board Name	Get the current board name
	Get Board Data	Get the current board data in XML format
Miscellaneous	Get Version	Get the version of the Gong applet

**Table 1. List of available requests in the Gong scripting interface.**

Alternatively the Gong API also accepts text parameters instead of an XML formatted request, in the form of:

*String sendGongRequest(String name, String param1, String param2, ...)*

This caters for any scripting language which lacks support for XML.

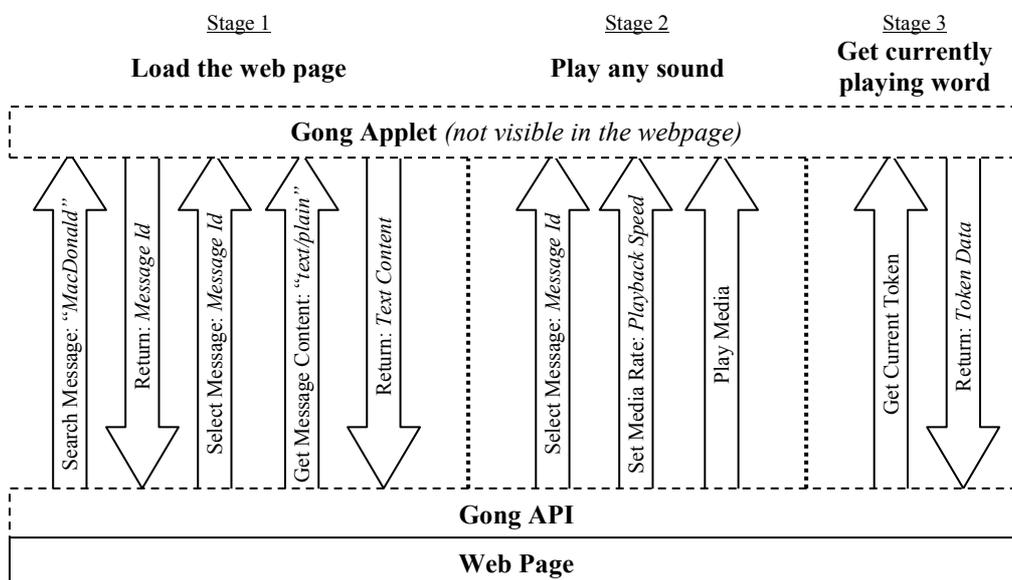
## 2.2 Discussion

The Gong scripting interface introduces flexibility in designing web content. It is particularly useful for language courses where an audio enriched web page can greatly improve the course content in terms of interaction and pedagogical usefulness. Figure 4 below shows an example of an interactive web page.



**Figure 4. “Old MacDonald Had a Farm” - an audio enriched web page using the Gong system.**

This web page contains many images. There are eight of them representing the sounds of animals, as illustrated in Figure 4. There are also a few of them in the lower left corner which are used to play the song, “Old MacDonald Had a Farm”. Once an image is clicked the corresponding audio recording will be played. The web page also makes use of two advanced features of the Gong system. First, a user can choose to play the song faster or slower. Second, while the web page is playing the song it highlights the current word being sung. These two features can be very useful for language learning material.



**Figure 5. The flow of communication between the web page and the applet shown in Figure 4.**

Figure 5 illustrates the communication between the web page and the Gong applet in the example shown in figure 4. The flow can be divided into three different stages.

- **Stage 1 – Load the web page**

After the page is loaded, the web page shows the lyrics of the song in the page. This is achieved by the script in the web page by looking for the appropriate message on the Gong voice board and retrieving its text content.

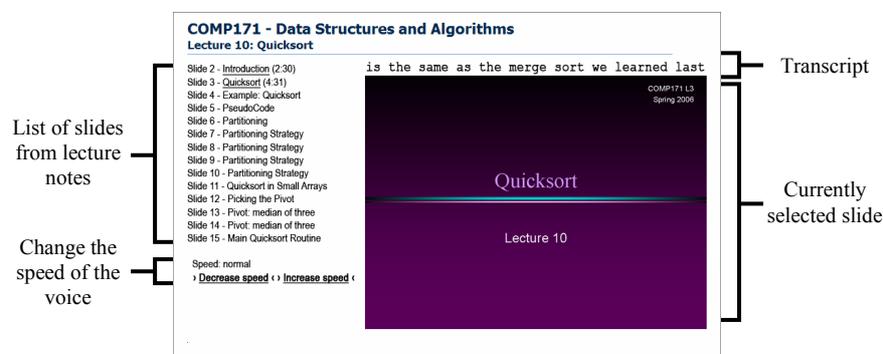
- **Stage 2 – Play any sound**

When the user selects one of the images for playing back a sound recording this stage will get executed. It simply tells the applet to play the message at a certain rate, i.e. playback speed.

- **Stage 3 – Identify and highlight currently playing word**

This stage involves the display of the currently playing word. During the playing back of the song the web page highlights the current word being played in the lyrics of the song. This is achieved by constantly asking for the word, which keeps changing over time, from the applet. The word is stored and transmitted as a token that also contains other information such as position in the message and timing. The web page scripting can then search and modify the appearance of the appropriate word which was originally put on the page in stage 1 above.

In addition we have used similar techniques to create an example of an online lecture. Figure 6 shows the layout of this web page. On the left is a list of selectable slides of the lecture notes. On the right is shown the currently selected slide. A student can start playing the audio of the lecture. The corresponding audio is played, and the transcript is scrolled at the top of the slide. Similar to the first example, a student can listen to the lecture at a speed which he/she controls.



**Figure 6. A recorded lecture on a web page.**

The above two examples show that, using the Gong scripting interface, audio resources can be integrated in the web page. Students do not need to switch back and forth and there are no external programs used for audio processing. What the student is looking at is the web page only. In addition, the advanced features provided by the Gong system can improve the pedagogical use of audio resources. In both examples, voices can be played faster or slower. For example, a student can choose to play a voice slower if he/she finds it difficult to comprehend the speech content. Furthermore, word indexing helps English learning students keeping up with the pace of the speech. These features provide a good platform for teachers, especially language teachers, to design and build interactive course material on the Web.

### 3 Integration with Learning Management Systems

Learning management systems (LMS) are nowadays commonly used in educational institutions. There is a wide range of LMS available. These include both commercial and non-commercial systems, such as WebCT [8] and Moodle. However, these systems typically do not have embedded support for audio communication [9]. Use of the Gong system within a LMS can greatly enhance interactivity amongst students and teachers. The next section outlines the method for using the Gong system in any LMS.

#### 3.1 Methodology

A generic method has been implemented in the Gong system in order to integrate it with an arbitrary LMS based on these requirements:

- **Single Sign-on.** The user does not need to sign on to the Gong system after signing on to the LMS.
- **Transparent to Users.** The integration is transparent to ordinary users. In other words, from an experiential point of view the Gong system is part of the LMS.
- **Simple and Easy Integration.** The integration procedure is simple and easy to set up for administrators.

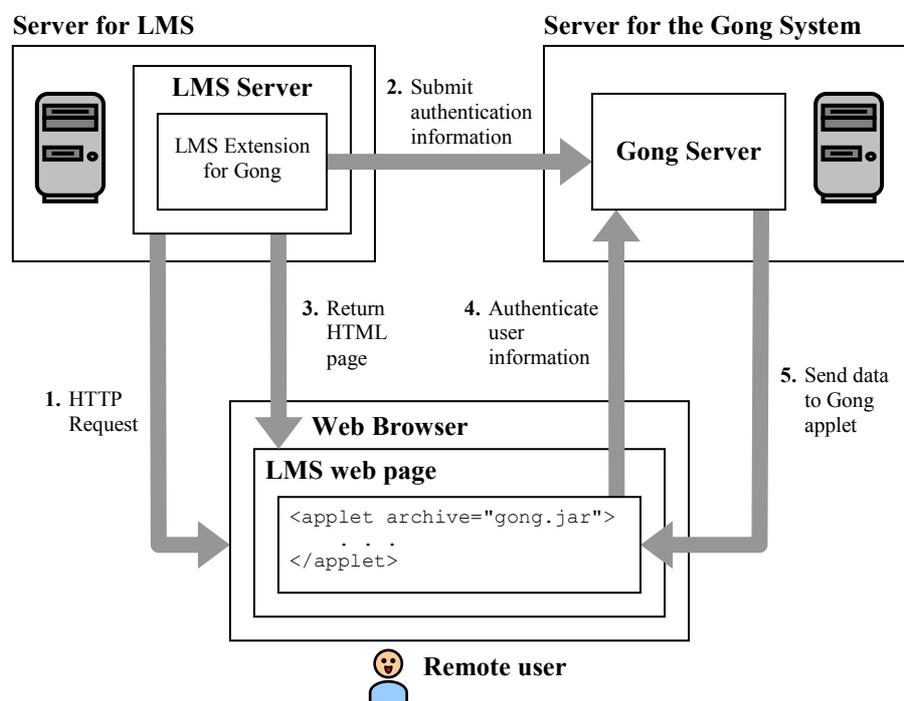


Figure 7. Overview of integration of the Gong system together with a LMS.

The structural view of our integration method is shown in Figure 7. The integration involves two servers, the LMS server and the Gong server. To achieve single sign-on the LMS server has to establish a connection with the Gong server. This connection allows the LMS server to send user authentication

and other information to the Gong server. To be secure only the LMS server is allowed to send this information to the Gong server. In addition the LMS server is responsible for putting the applet in the appropriate LMS web pages. Once the applet is displayed on a browser the applet will contact the Gong server and start asking for data. Before sending any data, the Gong server authenticates the applet based on the user information sent by the LMS server. Therefore when the user sees the applet it is already authenticated with the correct information as if it is part of the LMS.

As shown in Figure 7, an extension has to be developed which is particular to the LMS in order to permit it to support integration with the Gong system. This extension is responsible for communicating with the Gong server as well as adding the Gong applet in an appropriate context. We have developed an extension for one of the most popular open-source LMS, the Moodle LMS. The following section discusses how the integration can be done for Moodle.

## **3.2 Discussion**

We have demonstrated the integration of the Gong system with the Moodle LMS. This experiment not only is a proof of concept but also provides an opportunity to see how many people are interested in the kind of audio capability provided by Gong in LMS systems.

### **3.2.1 Example Integration with Moodle**

To integrate the Gong system into the Moodle LMS a Moodle extension has been developed. This extension has been implemented by building a Moodle module, which is a method to build tools and extensions in the Moodle LMS. Using a customized Moodle module, Gong can be plugged into any current Moodle installation easily without having to build and install the LMS again. Once the module is in the system users can then create, modify and view Gong as an activity in any course.

The implementation of the module can be divided into three different parts. It should be understood that the following descriptions are Moodle specific. For other LMS different implementations would be required which are specific to that system.

- **Specification of storage requirement**

An SQL table is created for the storage of information for each Gong activity.

- **The configuration of the Gong activity**

When a user creates a new Gong activity he/she can specify a list of parameters such as the name of the activity and the color of the Gong interface. A Gong activity is highly configurable, although under typical usage most of these parameters contain default values. Figure 8 shows the configuration of a new Gong activity in a Moodle course.

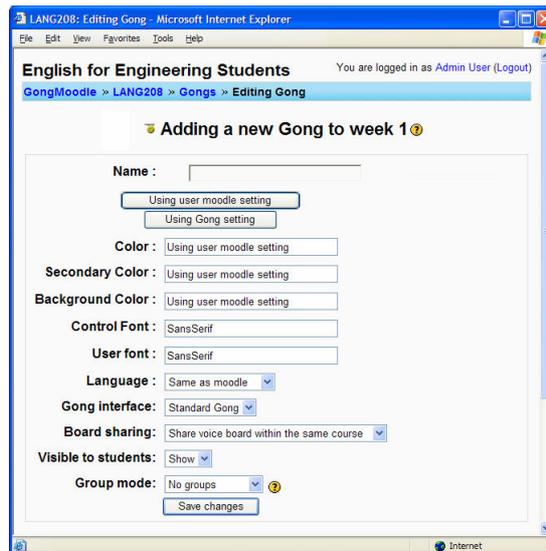


Figure 8. The configuration of a new Gong activity

- **The display of the Gong activity**

Once a Gong activity is selected the Moodle LMS will try to contact the Gong server and send authentication information to it. Authentication information typically includes the user details and the Gong voice board being requested. After that, a Gong applet will be displayed based on the configuration of the activity. Figure 9 shows an example of a Gong voice board activity within a Moodle course.

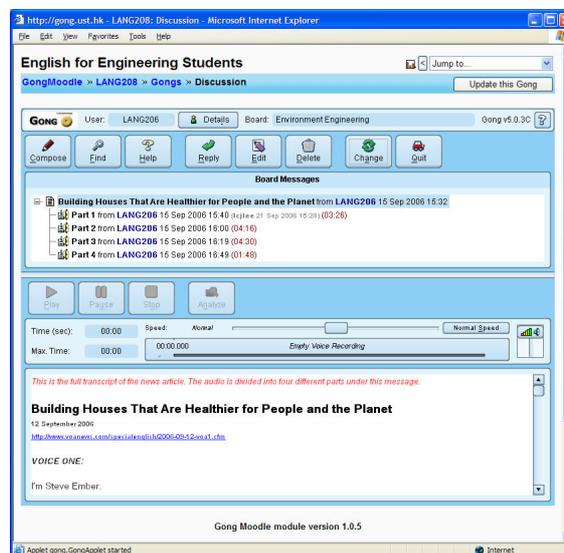


Figure 9. The Gong system and the Moodle LMS working together.

## 4 Conclusion

In this paper we have discussed two aspects of the Gong system. The first aspect is the ability to enhance web page content through the use of the Gong scripting interface. This interface allows any web page to communicate in real-time with the Gong applet. A web content developer can therefore

create audio enriched web content by using the various features of Gong. We then explained how the Gong system can be integrated with an arbitrary learning management system (LMS). Using our method the Gong system can be easily and smoothly integrated into any LMS. This integration has been demonstrated by using the Moodle open source LMS.

## **5 Acknowledgements**

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